

This miniproject asks you to start thinking in terms of formal proofs and be able to spot errors in formal proofs.

Do the following problems.

- (a) Give a formal proof for the Lewis Carroll argument in Example 26 of Section 1.3.
- (b) Give a formal proof for the Lewis Carroll argument in Example 27 of Section 1.3.
- (c) Find and explain all error(s) in the formal “proof” below, that attempts to show that if $\exists xA(x) \wedge \exists xB(x)$ is true, then $\exists x(A(x) \wedge B(x))$ is also true (which is not true).

Step	Reason
(1) $\exists xA(x) \wedge \exists xB(x)$	premise
(2) $\exists xA(x)$	simplification of (1)
(3) $A(c)$	existential instantiation from (2)
(4) $\exists xB(x)$	simplification of (1)
(5) $B(c)$	existential instantiation from (4)
(6) $A(c) \wedge B(c)$	conjunction from (3) and (5)
(7) $\exists x(A(x) \wedge B(x))$	existential generalization

- (d) Find and explain all error(s) in the formal “proof” below, that attempts to show that if $\forall x(A(x) \vee B(x))$ is true, then $\forall xA(x) \vee \forall xB(x)$ is also true (which is not true).

Step	Reason
(1) $\forall x(A(x) \vee B(x))$	premise
(2) $A(c) \vee B(c)$	universal instantiation from (1)
(3) $A(c)$	simplification from (2)
(4) $B(c)$	simplification from (2)
(5) $\forall xA(x)$	universal generalization from (3)
(6) $\forall xB(x)$	universal generalization from (4)
(7) $\forall xA(x) \wedge \forall xB(x)$	conjunction from (5) and (6)